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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/801,450	03/15/2004	Henrique S. Malvar	MCS-082-03	3243

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MICROSOFT CORPORATION
C/O LYON & HARR, LLP
300 ESPLANADE DRIVE
SUITE 800
OXNARD, CA 93036

EXAMINER

LAROSE, COLIN M

ART UNIT	PAPER NUMBER
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2624

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/801,450	Applicant(s) MALVAR ET AL.	
	Examiner COLIN M. LAROSE	Art Unit 2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 June 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9, 12-25, 27, 28 and 31-40 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 9, 12-25, 27, 28 and 31-36 is/are allowed.
- 6) ☒ Claim(s) 1-8 and 37-40 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>4/14/08</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Amendments and Remarks

1. Applicant's amendments and remarks dated 26 June 2008, have been entered and made of record.

Response to Amendments and Remarks

2. Regarding independent claims 1 and 37, Applicant argues that Lu does not disclose that the interpolation and the correction term are "linearly" combined, as claimed. This argument is unpersuasive. As explained in the previous Office action, Lu calculates an interpolation value, $(G_{\text{preceding}} + G_{\text{following}})/2$, and a correction term, $(2B_0 - B_{-2} - B_2)/2$. These two values are then added together—see column 5/55-60. As is known in the art, a linear combination of variables is a sum of scalar multiples of those variables. Simple addition, as performed here by Lu, is therefore considered a linear combination.

Applicant also argues that Kalevo does not disclose that the interpolation and the correction term are "linearly" combined, as claimed. However, as shown at column 5/30-35, the interpolation, AvgG, is added to a scalar multiple of the correction term, LapCorTerm, to produce the corrected interpolation value. That is, the corrected interpolation value is produced by a linear combination of AvgG and LapCorTermG.

Claim Rejections - 35 USC § 101

3. In view of Applicant's amendments, the previous rejections under § 101 have been withdrawn.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 1-8 and 37-40 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent 5,805,217 by Lu et al. ("Lu").

Regarding claim 1, Lu discloses a method for interpolating a desired color (i.e., green) at a current pixel in a color image, the current pixel having a current color (i.e., blue), comprising:

computing an interpolation of the desired color at the current pixel using the desired color (column 5/55-60: interpolation of green (G) computed as $(G_{\text{preceding}} + G_{\text{following}})/2$);

computing a correction term using the current color (column 5/55-60: correction term using blue (B) calculated as $(2B_0 - B_{-2} - B_2)/2$); and

linearly combining the interpolation and the correction term to obtain a corrected interpolation of the desired color at the current pixel (column 5/55-60: $(G_{\text{preceding}} + G_{\text{following}})/2$ is linearly combined with $(2B_0 - B_{-2} - B_2)/2$ to interpolate the green color for the pixel).

Regarding claim 2, Lu discloses using neighboring pixels of the desired color in computing the interpolation (i.e., $G_{\text{preceding}}$ and $G_{\text{following}}$ are colors of neighboring pixels).

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Regarding claim 3, Lu discloses using the current pixel in computing the correction term (i.e., B_0 is the current pixel).

Regarding claim 4, Lu discloses using neighboring pixels of the current color in computing the correction term (i.e., B_{-2} and B_2 are neighboring pixels).

Regarding claim 5, Lu discloses the interpolation is a bilinear interpolation technique ($(G_{\text{preceding}} + G_{\text{following}})/2$ is a bilinear technique).

Regarding claim 6, Lu discloses the correction term is a gradient correction (i.e., $2B_0 - B_{-2} - B_2$ corresponds to gradients between the center pixel and neighboring pixels).

Regarding claim 7, Lu discloses applying a gradient-correction gain to the gradient correction to determine the amount of the gradient correction linearly combined with the interpolation (i.e., the sigma gain is applied to the gradient correction).

Regarding claim 8, Lu discloses adding the interpolation and the correction term to obtain a corrected interpolation (see column 5/55-60).

Regarding claim 37, Lu discloses a gradient-corrected linear interpolation system (figure 1) for interpolating a missing color value at a given pixel in a color image, the given pixel having a current color, comprising: a general purpose computing device; and a computer-readable medium having stored and encoded thereon a computer program having program modules containing computer-executable instructions that are executable by the general-purpose computing device, the computer program further comprising: an interpolation module (36) that computes an interpolation of the missing color value; a correction term computation module (36) that computes a correction term for the interpolation; and a linear combination module (36) that

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linearly combines the interpolation and correction term to produce a corrected interpolation for the missing color value at the given pixel.

Regarding claim 38, Lu discloses the correction term computation module further comprises a region of support module that selects a size of a region of support around the given pixel centered at the given pixel (i.e., the interpolation processor 36 selects the support region according to the equation at column 5/55-60).

Regarding claim 39, Lu discloses the correction term computation module further comprises a gradient-correction selector that selects the amount of correction that will be linearly combined with the interpolation (i.e., the interpolation processor 36 selects the amount of correction (sigma) according to the equation at column 5/55-60).

Regarding claim 40, Lu discloses the correction term computation module further comprises a gradient correction module that computes a gradient correction using the given pixel and pixels in a region of support having the current color (i.e., the interpolation processor 36 computes the gradient correction factor computed as $2B_0 - B_{-2} - B_2$).

6. Claims 1-8 and 37-40 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent 7,236,191 by Kalevo et al. ("Kalevo").

Regarding claim 1, Kalevo discloses a method for interpolating a desired color at a current pixel in a color image, the current pixel having a current color, comprising:

computing an interpolation of the desired color at the current pixel using the desired color (column 4/35-49: interpolation of green (AvgG) computed as $(G_4 + G_6)/2$ for the horizontal direction or $(G_2 + G_8)/2$ for the vertical direction);

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computing a correction term using the current color (column 4/1-20: correction term using blue (B) or red (R) calculated as LapCHor and LapCVer and assigned to LapCorTermG at column 4/35-49); and

linearly combining the interpolation and the correction term to obtain a corrected interpolation of the desired color at the current pixel (column 4/35-49 and column 5/30-35: AvgG is linearly combined with LapCorTermG to interpolate the green color for the pixel).

Regarding claim 2, Kalevo discloses using neighboring pixels of the desired color in computing the interpolation (i.e., G2-G8 are colors of neighboring pixels—see figure 2).

Regarding claim 3, Kalevo discloses using the current pixel in computing the correction term (i.e., R5 and B5 are used).

Regarding claim 4, Kalevo discloses using neighboring pixels of the current color in computing the correction term (i.e., R1, R3, R7, R9 and B1, B3, B7, B9 are neighboring pixels).

Regarding claim 5, Kalevo discloses the interpolation is a bilinear interpolation technique (AvgG is a bilinear interpolation).

Regarding claim 6, Kalevo discloses the correction term is a gradient correction (i.e., LapCHor and LapCVer corresponds to gradients between the center pixel and neighboring pixels).

Regarding claim 7, Kalevo discloses applying a gradient-correction gain to the gradient correction to determine the amount of the gradient correction linearly combined with the interpolation (column 5/30-35, gain is applied to the gradient correction LapCorTerm).

Regarding claim 8, Kalevo discloses adding the interpolation and the correction term to obtain a corrected interpolation (see columns 4/35-49 and 5/30-35).

Regarding claim 37, Kalevo discloses a gradient-corrected linear interpolation system (column 2/20-33: apparatus; column 2/34-48: program) for interpolating a missing color value at a given pixel in a color image, the given pixel having a current color, comprising: an interpolation module that computes an interpolation of the missing color value; a correction term computation module that computes a correction term for the interpolation; and a linear combination module that linearly combines the interpolation and correction term to produce a corrected interpolation for the missing color value at the given pixel.

Regarding claim 38, Kalevo discloses the correction term computation module further comprises a region of support module that selects a size of a region of support around the given pixel centered at the given pixel (figure 2: 5x5 region of support selected).

Regarding claim 39, Kalevo discloses the correction term computation module further comprises a gradient-correction selector that selects the amount of correction that will be linearly combined with the interpolation (column 5/30-35: gain selected).

Regarding claim 40, Kalevo discloses the correction term computation module further comprises a gradient correction module that computes a gradient correction using the given pixel and pixels in a region of support having the current color (column 4/1—5/35, gradient correction factor computed as LapCorTerm).

Allowable Subject Matter

7. In view of Applicant's amendments, claims 9, 12-25, 27, 28, and 31-36 are allowed.

Conclusion

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Colin M. LaRose whose telephone number is (571) 272-7423. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Brian Werner, can be reached on (571) 272-7401. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would

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like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000. Any inquiry of a general nature or relating to the status of this application or proceeding can also be directed to the TC 2600 Customer Service Office whose telephone number is (571) 272-2600.

/Colin M. LaRose/
Colin M. LaRose
Primary Examiner
Group Art Unit 2624
22 August 2008